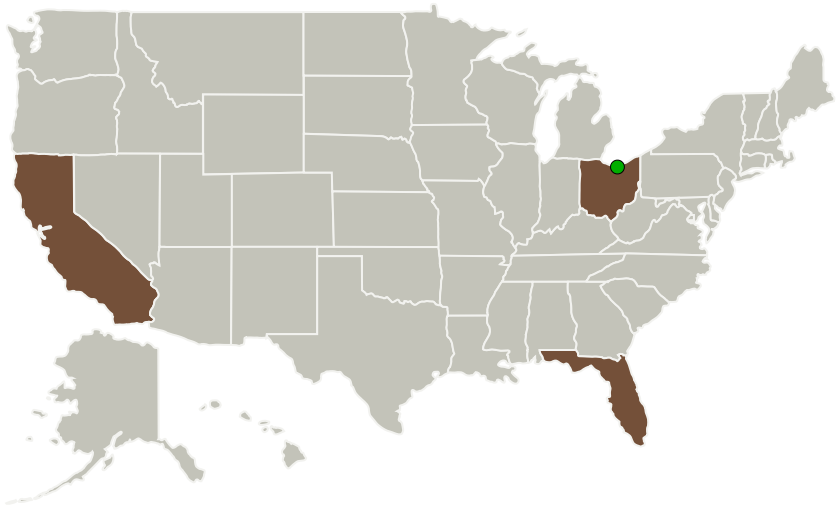
Thin Film Lithium Niobate Microring Modulators for Analog Photonics, Phase I

Completed Technology Project (2016 - 2017)

Project Introduction

Lithium niobate (LiNbO3) has been long regarded as the most attractive material for electro-optic modulation for high-performance optical communication systems of up to 100 GHz, as well as for its superior second-order optical non-linearity. The weakly confined LiNbO3 waveguides formed by diffusion or implantation of dopants do not lend themselves to high-level chip integration. One key novel technology proposed here, and supported by preliminary results, is developing submicron LiNbO3 films on silicon substrates using ion implantation, surface activation and wafer bonding. The technology allows to make optical waveguides with high index-contrast of ~2.2/1.5. To avoid direct etching of the hard LiNbO3 material, a loaded ridge waveguide formation is proposed. Based on these two technologies, LiNbO3 microring modulators with wide modulation bandwidth and compact size are proposed for analog photonics applications. The modulators can achieve good linearity, high power and wide modulation bandwidth simultaneously and have a very small size.

Primary U.S. Work Locations and Key Partners



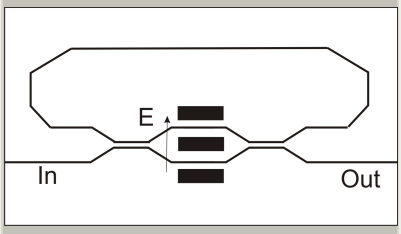


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Table of Contents

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Organizations Performing Work	Role	Type	Location
Partow Technologies LLC	Lead Organization	Industry	Orlando, Florida
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio
University of Central Florida(UCF)	Supporting Organization	Academia	Orlando, Florida

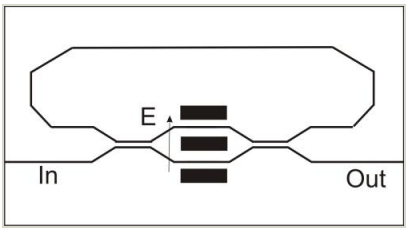
Primary U.S. Work Locations	
California	Florida
Ohio	

Project Transitions

June 2016: Project Start

June 2017: Closed out

Images



Briefing Chart Image
Thin film lithium niobate microring modulators for analog photonics, Phase I
(https://techport.nasa.gov/image/135670)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Partow Technologies LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

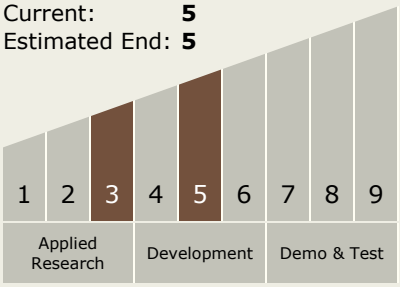
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Payam Rabiei

Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.2 Radio Frequency
    - TX05.2.2 Power-Efficiency

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System